(54) Title: ON-DEMAND CONNECTION SYSTEM FOR INTERNET SERVICES
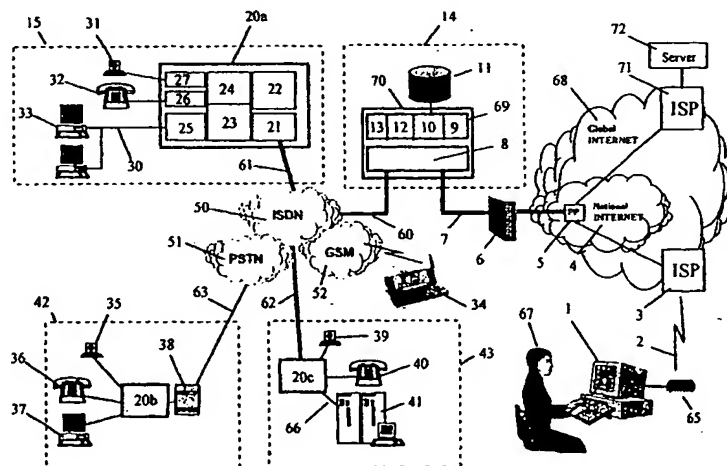
(57) Abstract: This invention relates to a connection on-demand Internet network apparatus that accepts requests from browser clients to deliver multimedia services to the Internet over a switched network from a remote site without a permanent connection to the Internet. This invention provides a connection on-demand Internet network connection apparatus in two parts: The central site "Network Exchange" comprising of a Network Traffic Manager remote access router function connected to the Internet, capable of mapping an IP address to a telephone number and handling PPP (Point to Point Protocol) and proprietary protocols to enable TCP/IP connection to a remote router; and a Network Services Platform to provide local community facilities such as: DNS servers, e-mail servers, cache memory, NNTP (News) services, Proxy servers and Firewall services. The remote site part of the apparatus comprises: a Web server, router,data communications equipment, Voice over IP hardware and software; Video hardware and software; Network Interface Module (s) and software; and various software tools for diagnostics, monitoring, Dial Up Networking and Website editing. Further functionality includes: The ability to provide secure co-located e-commerce Websites connected into a Local Area Network to provide integrated e-commerce solutions and real-time connection to internal databases via ODBC connectivity. Outbound multi-user access the Internet on-demand, and e-mail services. Secure virtual private networking on-demand for Voice over IP, Video, and "Whiteboard" conferencing. Connection and access by mobile GSM phones to the Internet; corporate databases and order entry systems via the on-demand connection apparatus.

On-Demand Connection System for Internet Services

This invention relates to a network apparatus that enables the delivery of multimedia services (e.g. Voice over IP, video, electronic file transfers, and secure electronic commerce) to Internet browsing clients, on demand from a server located at a remote site, without the need for a permanent on-line connection to the Internet.

At present, the fact that website servers require permanent connections to the Internet to provide 24 hours a day service is well known.

Three types of apparatus to permanently connect website servers to the Internet are well known and used by Internet Service Providers.

The first type of apparatus comprises the use of a remote website server connected to a router, linked to the central site via a permanently connected leased line circuit, connected to a router/connection to the Internet.

A major disadvantage of this type of apparatus is the high cost of operation. Few websites have the traffic volume to justify the expense of permanently connected bandwidth. The user pays for the use of the communication link, even when there is no traffic.

A second type of apparatus comprises a dedicated website server connected directly to the Internet via a router/connection on an Internet Service Provider's (ISP) premises.

This type of dedicated website server hosting apparatus can be expensive, and has the further disadvantage of the owner having to maintain the website server from a remote location.

A third and most common type of apparatus comprises a number of (virtual) "website servers" implemented in software on a dedicated server connected directly to the Internet via a router/Internet connection on an Internet Service Provider's premises.

This type of virtual website server hosting apparatus has a number of disadvantages. Aside from the reduced performance from having many virtual servers on one real server, there are security risks from sharing a common root directory, and often limitations set on the use of CGI (Common Gateway Interface) and interactive scripting. The owner has to maintain the website from a remote location.

Until now, a reliable apparatus to enable a website server at a remote premises to be connected to the Internet via a dial up (PSTN/ISDN) switched network connection has not been available. Dial up connections have been used only as a means to access the Internet rather than to provide a reliable means of website hosting.

An object of this invention is to provide a service-on-demand Internet network apparatus to enable servers located at remote sites to be able to respond to incoming browser requests without the need for a permanent connection to the Internet.

Accordingly this invention provides a services on demand Internet network apparatus that accepts requests from browser clients to deliver multimedia services to the Internet over a switched network from a remote site without a permanent connection to the Internet, the apparatus comprising a central site access router / NTM (Network Traffic Manager) function directly connected via a backbone bandwidth connection to the national Internet Peering Point. The apparatus constantly monitors the Internet for URL and IP requests for the addresses held in its DNS servers on the apparatus NSP (Network Services Platform). The NTM is capable of mapping an IP address to a telephone number, dialing, and handling PPP (Point to Point Protocol) and other proprietary protocols to enable a TCP/IP connection to be established with a remote (WebDrive) router and website server unit by means of the DEC (Data Communications Equipment) over a switched PSTN or ISDN network.

The apparatus enables the Web server device to be connected directly to a Local Area Network and local databases, provides a high level of security and user authentication protected by NAT and software firewalls, and thus, can be used for secure, real-time electronic commerce applications. This is not possible on the ISP virtual server.

This makes it possible to link directly into Local Area Networks and to connect the web server in real-time to other database servers to enable the true integration of the business systems (order entry, inventory, stock control etc.) to the Internet website. This is not possible on an ISP "hosted" website.

The apparatus software supports integration with ODBC compliant databases.

The network apparatus can also be configured to enable a TCP/IP connection, on-demand, from the remote site toward the Internet enabling multi-user access to the Internet, e-mail, Voice over IP or Video calls to be established, on-demand from the remote site.

The network apparatus makes it possible to call any other site connected to the central network exchange, enabling high speed, secure VPN (Virtual Private Networking) on-demand, for Voice over IP or Video calls; data file transfers, and/or browsing.

Because this is within the closed network packet delays are virtually non-existent and thus video and Voice over IP performance can be guaranteed. This is not possible over the Internet. It is also possible to use the apparatus to connect country-to-country. This can be done via the national and global Internet or by "dedicated IP" circuits such as

those provided by V-SAT links. This enables quality Voice over IP and video to be transmitted globally.

The apparatus makes it possible to provide additional services such as local e-mail, DNS services, NNTP (News) services; Firewall and Proxy services between the apparatus network community and the Internet. This includes the ability to filter "junk e-mail", pornography, and most viruses before they reach the end user. (an excellent application of the apparatus would be to provide e-mail, Voice/video conferencing, and filtered Internet access for a community of schools or multiple corporate office sites.

The apparatus makes it possible to do multiple site group conferencing using special software, for example O'Reilly "WebBoard".

The apparatus makes it possible to provide secure "tunneling" to enable authorised outside access into resources located on the Local Area Network normally protected by firewall and NAT (Network Address Translation). For example, a tele-worker being able to access corporate files from home.

The apparatus also supports GSM (Mobile Telephone) traffic so it is possible to access Websites and databases inside the apparatus community. For example a salesman could access a factory database at one site to check stock levels, then place an order on another site via a handheld PDA with the ability to connect and send data via the GSM network. An example of this type of device is the Nokia 9100.

The apparatus can support a number of communication devices. It can be used with devices, for example in the UK, the "BT Highway" device that converts an analogue PSTN line into a digital ISDN service.

The apparatus is designed to support STAC data compression to enable a data traffic rate higher than the nominal bandwidth of the switched network link. Compression rates of 4:1 are possible on most traffic between the remote and the central parts of the apparatus.

The delivery performance of the apparatus can be further enhanced by the addition of a cache device at the central site on the NSP (Network Services Platform) to provide automatic caching of image files closer to the Internet backbone and thus after their first transmission, images from the remote web server will only have to be updated periodically rather than being retransmitted over the PSTN/ISDN connection.

Permanent disk space can also be provided at the central site on the NSP (Network Services Platform) to back up the remote site server, or provide file space on the Internet backbone for fast image transfers.

Proprietary protocols may be used between the NTM and remote website server to reduce connection latency and improve the performance of the website server.

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A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing 1/1 in which :

Drawing 1/1 shows a block diagram of the Central Site 14 part of the apparatus. This comprises the Network Exchange 70 consisting of the NTM (Network Traffic Manager) 8 and the NSP (Network Services Platform) 69 comprising of DNS servers 13; E-mail server 12; Cache Server 10 and hard disk storage 11; and optional Proxy server 9 and Internet Firewall 6, etc. The NTM 8 has a permanent backbone connection 7 to the Internet via the country's Peering Point (the point where all ISPs have network to network peering and the country joins the global Internet 68). The NTM 8 is also directly connection via a PRI (Primary Rate ISDN) circuit 60 to the switched networks, either ISDN 50, PSTN 51 and GSM 52 (Mobile Telephone) networks.

The "Remote Site" part of the apparatus is the WebDrive 20a, shown in detail in the diagram of Remote Site 15; and is comprised of: a DCE (Data Communications Equipment) interface 21 (e.g., modem, ISDN, xDSL, ATM, RF, or other communications interface / adapter); a hardware or software router 23; a HTTPd Internet server 24 (this can also include servers providing other services, such as e-mail, Intranet, etc); NIC (Network Interface Card(s)) 25; Voice over IP hardware and software 26; and Video hardware and software 27. Also included on this platform are software tools 22 for website editing, scanning image editing, website monitoring, and diagnostic software. These tools can be updated from Internet support sites.

· Refer to drawing 1/1

When a person 67 requests via browser client software 1, services on web server 24 on the remote site by entering its web page URL (Uniform Resource Locator), the request is sent via a communications device 65 and network 2 via a local ISP 3, the request propagates through the global Internet 68 and national Internet 4 to reach the Peering Point 5 where it is picked up by the NTM (Network Traffic Manager) 8 and resolved into an IP (Internet Protocol) address by DNS (Domain Name Service) 13 on the NSP (Network Services Platform) 69.

The NTM 8 maps the IP address to a remote site's (PSTN or ISDN) dial-up number [an example of this is the ITK MicaBlazerTM central site remote access server]. NTM 8 dials into the Public Switched Network via a PRI (ISDN) 60 service. In the case of Remote Site 15, this goes out on an ISDN local subscriber loop 61 and reaches the WebDrive device 20a.

DCE 21 detects an incoming call on the "D" channel and initiates an appropriate ISDN (digital) answer sequence with the ISDN network 50 and the NTM 8 connects with PPP (Point to Point Protocol) ; PAP/CHAP security sequence; compression enabled and a TCP/IP connection is routed through to the Internet 4 and the ISP 3 to the browser client

1 that initiated the request. All this typically takes less than 2 seconds to complete, making the connection as fast, or faster than most "routed" connections via an ISP.

The Connection on-demand Internet website server apparatus 20a having opened a TCP/IP connection, can now accept requests from the browser client 1 (or simultaneously from other browsers from the Internet) and deliver multimedia web objects such as home pages from the web server 24 or other servers at Remote Site 15 via the local area network 30.

When data traffic has ceased after a predetermined period, either router 23 or the NTM will initiate disconnect sequence for the ISDN line 60/61 until the next incoming call is received, or the Remote Site 15 wishes to initiate a connection.

Thus web server 24 at the Remote Site 15 can be accessed 24 hours per day on a service on demand basis, rather than having to be permanently connected to the Internet.

This makes it possible, for example, to connect a Web site 20c to a local real-time database server 41, connected using the ODBC 66 compliant protocol language included in the remote part of the apparatus.

Furthermore, Remote Site 15 can initiate a connection to the Internet. When a computer 33 enabled with a client browser (connected directly or on a LAN) requests a URL that is not available locally the router 23 will establish a DUN (Dial Up Networking) connection via the ISDN network 50, using PPP protocol, with the NTM 8, which in turn will provide services locally, or route the request on to the Internet 4. Again the connection is terminated by the router 23 or the NTM 8 when there is no longer data activity on the circuit. The WebDrive 20a device also functions to provide intranet, local e-mail, and local video/Voice over IP services.

Furthermore, it is possible to establish Virtual Private Networks for Voice over IP, video and "whiteboard" conferencing.

An additional feature is the ability to contact other "Remote Sites" that are part of the apparatus's community. Because the connection is made on demand, it is possible to make Voice over IP and Video call on demand to other sites. (At the moment this requires meeting on a server at a certain time, etc.)

A typical example of a Voice over IP or Video call from Remote Site 15 would be as follows. The telephone handset 32 or Video camera 31 interacts with the hardware/software 26/27 and requests a destination URL. This interacts with router 23 to make a DUN (Dial Up Networking) call via DCE 21 to the NTM 8 at the central site 14. The requested URL will be resolved by DNS 13 and if it is within the apparatus community it will automatically re-dial (via PRI 60) the designated remote site (e.g. say Remote site 42 where the remote site part of the apparatus ("WebDrive" 20b) will answer the call (with handshaking and security as previously described) and the end-to-

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end TCP/IP connection will be complete. It is now possible to send a signal to "ring" the telephone 36 or to alert PC 37 of an incoming voice or video call.

Furthermore it is possible, for example, to connect mobile GSM devices 34 to access corporate databases 41; or, for example, a Web site 24. The Mobile 34 dials into the GSM Network 52 and is connected via PRI 60, to the NTM (Network Traffic Manager) 8, calls are then handled in the same manner as described above. In some cases with "mobile TCP/IP" it is also possible to contact mobile devices in the reverse direction from, for example, PC 33.

In the future the Network Exchange 70 will be able to provide a Voice over IP H.323 gateway to enable VoIP traffic to entry the PSTN network.

CLAIMS

1   A connection on-demand Internet network apparatus that accepts requests from browser clients to deliver multimedia services to the Internet over a switched network from a remote site without a permanent connection to the Internet, the apparatus comprising a central site access routing function connected to the Internet, capable of mapping an IP address to a telephone number and handling PPP (Point to Point Protocol) and proprietary protocols to enable TCP/IP connection to a remote router and Web site server devices by means of data communications equipment over a switched network.

2   A connection on-demand Internet network apparatus as claimed in Claim 1 wherein the switched network is a PSTN (Public Switched Telephone Network), ISDN (Integrated Services Digital Network), GSM (Mobile telephone) Network, and/or xDSL network and/or on a network or local subscriber loop circuit.

3   A connection on-demand Internet network apparatus as claimed in Claim 1 wherein the routing function is implemented in software and/or on a hardware platform.

4   A connection on-demand Internet network apparatus as claimed in Claim 1 wherein the Web site server function is implemented in software and/or on a hardware platform.

5   A connection on-demand Internet network apparatus as claimed in Claim 1 wherein the data communications equipment function is implemented in software and/or on a hardware platform.

6   A connection on-demand Internet network apparatus substantially as described herein with reference to the accompanying drawing 1/1.
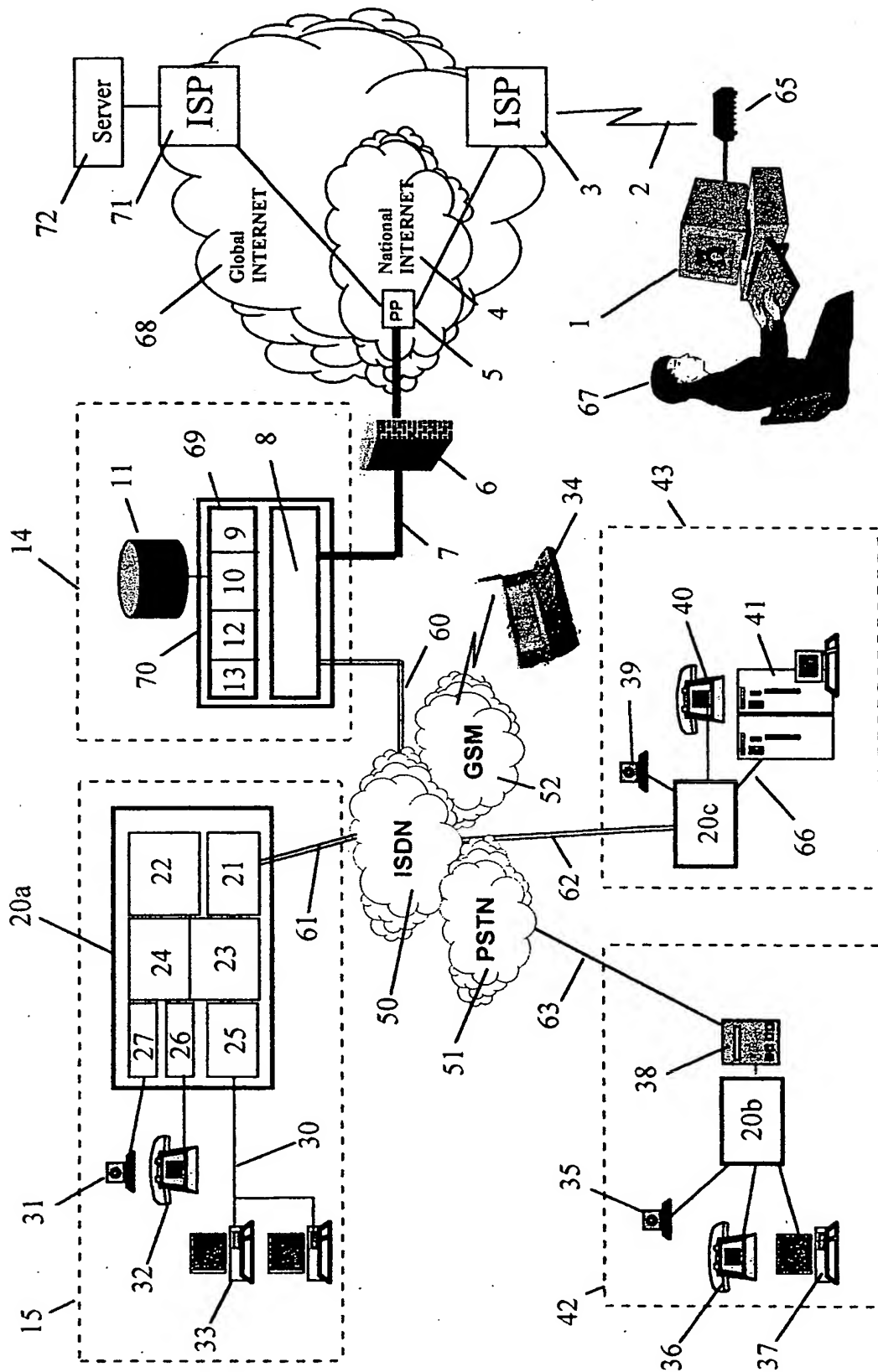
Drawing 1/1

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7   H04L12/66   H04M7/00   H04L12/64   H04L12/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7   H04L   H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	SIMEONOV P L ET AL: "INGATE: A DISTRIBUTED INTELLIGENT NETWORK APPROACH TO BRIDGE SWITCHING AND PACKET NETWORKS" PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON COMPUTER COMMUNICATIONS AND NETWORKS, 1 January 1997 (1997-01-01), XP002073675 abstract page 358; figure 1 page 358, right-hand column, line 17 - line 24 page 360, left-hand column, line 17 - line 43 page 362, right-hand column, line 15 - line 38 ___ —/—	1-6

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 February 2000	24/02/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2. NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Adkhis, F

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International Application No

PCT/GB 99/02642

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 35811 A (ERICSSON TELEFON AB L M) 15 July 1999 (1999-07-15) abstract page 4, line 12 – line 26 page 5, line 27 –page 6, line 13	1-6
A	EP 0 781 015 A (SONY CORP) 25 June 1997 (1997-06-25) abstract page 3, column 3, line 26 - line 55 page 3, column 4, line 7 – line 9 page 3, column 4, line 40 –page 4, column 5, line 22 figure 3	1-6

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

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WO 9935811	A	15-07-1999	AU	1992399 A	26-07-1999
EP 0781015	A	25-06-1997	JP	9168033 A	24-06-1997
			CA	2192739 A	19-06-1997
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